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ABSTRACT

As a means of studying the present public catalogs and possible catalog format alternatives at the Iowa State University library, a 6-week queuing study was conducted. Objectives of the study were (1) to determine the correlation between other library statistics (e.g., door counts and circulation records) and use of the public catalogs: (2) to calculate the ratio between use of the card catalog and the separate serials catalog: (3) to compare the library staff's use of the catalog with use by the public: and (4) to obtain information about use of the card catalog and the serials catalog in each of several autonomous library service points. The catalogs were observed in 234 10-minute periods. Numerical data gathered from observations are presented in the form of scatter diagrams and histograms comparing card catalog use, circulation counts, and exit counts. The results indicate little correlation between numbers of card catalog users and other staff-gathered user statistics. It was also found that card catalog users arrive randomly, and neither their numbers nor their arrival patterns can be predicted through use of other library statistics. (SW)

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A USER STUDY OF PUBLIC CATALOGS:

A QUEUEING APPROACH

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by

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Presented at the 1980 Annual Conference of the American Library Association; Research Forum Series of the Library Research Round Table

June 30, 1980

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ABSTRACT

The authors conducted a six-week queueing study of the public catalogs in the Iowa State University Library system. A total of 2,327 ten-minute random samples of usage were taken during 39 pre-determined peak hours of library use each week. A total of 29 catalog sites were sampled: card catalogs in the Main Library, one branch library and five reading rooms; and 22 serial catalogs (the sixteen sites in the Main Library were counted as one intellectual serials catalog for comparison with the one physical card catalog).

The data gathered from these samples are analyzed for the following purposes: 1) to determine if routinely gathered library statistics (namely, door counts and circulation statistics) can validly be used to predict catalog usage; 2) to determine the ratio of the usage of the ISU card catalog and the ISU serials catalog (which is printed in book format); 3) to pinpoint the peak half-hour usage period of the sampled periods in order to more closely measure the rate of use and provide more data to accurately predict the ideal number of alternative catalog devices to satisfy patron needs during those peak periods; 4) to determine the ratio of staff to patron use of the Library card catalog; 5) to measure usage of both card catalog and serials catalog in each of six self-contained library facilities; and 6) to show which areas of the divided card catalog experience heaviest use by patrons.

The results from the analyses indicate little correlation between numbers of card catalog users and other staff-gathered user statistics. This fact, in turn, made necessary a second six-week queueing study, conducted during the same time of the year but one year after the first study. During the "peak of the peak" periods, 2:00 to 2:30 p.m.--Mondays through Thursdays (this time block having been identified in the first study), the authors counted all entrants to the card catalog area by the minute. With these additional delineations of arrival patterns within a heavy-use period, the authors performed a goodness-of-fit test and found the data follow a Poisson distribution using a 95% confidence limit. This shows that users of the card catalog arrive randomly, and neither their numbers nor their arrival patterns can be predicted with the use of other library statistics.

Additionally, the authors determined a 60:40 ratio of serials book catalog use to card catalog use; an almost even distribution of users of the card catalog subject files and the author/title files; a total of 20.5% staff use of the card catalog during the days and hours sampled; and relatively light use of all public catalogs in the extramural collections participating in the study.

A USER STUDY OF PUBLIC CATALOGS: A QUEUEING APPROACH

Introduction

From January 8 through February 18, 1979, the authors conducted a queueing study in which they examined the use of the Iowa State University Library's public catalogs. This study was sponsored by the Library's Committee on the Public Catalog and Its Alternatives. This committee was appointed in November 1977 to investigate and meet a number of needs. It was charged with studying the present public catalogs and possible catalog format alternatives in light of several challenges facing the Library in the next decade. These challenges include managing limited funds, planning and completing a major building addition, considering the use of increasingly available technology, and weighing Library of Congress' decisions to close its card catalog and implement the second edition of the Anglo-American Cataloging Rules.

It became evident that knowledge of the actual number of public catalog users would aid the committee in making confident decisions about the future of ISU's public catalogs.

Few detailed studies have been published itemizing the quantity of catalog users at specific times. Several unique local factors made application of available findings difficult.

The Queueing Study Subcommittee, which included the authors, formed in November 1978 to plan and implement the systematic observation of people using the Library's public catalogs during the peak periods of Library use. We wanted to determine the extent to which the public catalogs

are used, the relationship of Library staff and patron use, and the areas of the card catalog which are most heavily used. Previously at Iowa State, estimation of catalog use had been largely intuitive or based upon questionnaire-survey approaches which were difficult to evaluate objectively. The Iowa State University Statistical Laboratory offered suggestions for the design of a statistically valid procedure.

The design of this procedure had to take into account the peculiarity that in the ISU Library no serials appear in the card catalog. Instead, they are listed in a computer-produced book catalog which is distributed to locations throughout the Library system. Staff members at public service areas had first-hand, though unmeasured, experience of heavy use of the serials catalog. With the queueing study, we hoped to quantify the use of the serials catalog in relation to the use of the card catalog. In evaluating alternative catalog formats, the Committee on the Public Catalog and Its Alternatives included the possibility of reintegrating serials and monographs in a new machine-readable system. The existing machine-readable serials records on tapes could form the base of a new COM or on-line catalog.

Secondly, we wanted to test the validity of using circulation and/or door count statistics as a means of predicting use of public catalogs.

Thirdly, we sought to measure the amount of the Library staff's use of the card catalog in comparison to the public's use. (Because many staff members have at-desk access to the serials catalog, Library staff use of the serials catalog was not counted in the public locations. This delineation has more meaning in the card catalog which is the sole source of bibliographic information for all users.) Knowledge of the patterns of Library staff use of the card catalog during the hours of the

Library's peak occupancy could assist administrators in scheduling personnel for the least-trafficked time periods. It might also help those making decisions concerning future catalog format and record format if the number of staff users were known.

The study also was structured to obtain information regarding use of the card catalog and the serials catalog in each of several autonomous library service points. These included one branch library, four reading rooms, and a self-contained collection within the Main Library building. In each, the card catalog provided bibliographic access to the monographic collection in that facility only. The serials catalog, providing access to all serials in the Library system, would be studied in these locations as well as in five staffed public services areas in the main building.

Methodology

In an attempt to gather data representing typical catalog use during the quarter, the study was conducted for a six-week period during which no university holidays or exams occurred. Observations were made during the following hours of the Library's peak occupancy: 10:00 a.m., 11:00 a.m., 1:00 p.m., 2:00 p.m., 3:00 p.m., 4:00 p.m., and 8:00 p.m., Sunday through Friday (excluding 10:00 a.m. and 11:00 a.m. Sunday and 8:00 p.m. Friday).

The card catalog in the main building contains 565,000 monographic titles described on 3,725,008 catalog cards. Author/title and L. C. subject heading cards are separated into two separate files. The physical area is made up of 1,500 square feet containing 41 72-drawer card catalog cabinets and eight tables varying in size from 2' x 6' to 3' x 12'. The annual serials catalog, in book format, contains bibliographic information for 30,000 titles as well as indexes to these titles by corporate body and subject and a cumulative supplement.

A total of 29 catalog sites were selected for the study. The card catalog sites included: the Main Library and six special locations (one branch library and five reading room catalogs). Serials catalog sites included: five staffed locations in the Main Library; eleven locations in the Main Library stacks; and six locations in the branch library and reading rooms.

Ten-minute observation periods were randomly assigned so that each ten-minute period within the designated peak-use hours would be sampled approximately 5-6 times (once for each day of the week). During each of the 234 observation periods, the number of patron arrivals and staff arrivals at the card catalog in the Main Library was recorded. To facilitate the counting of arrivals, the card catalog area was roped off with only one entrance/exit point. At the end of each observation period, the location of each patron within the card catalog area was marked on a schematic drawing of the area (Figure 1).

The card catalogs and serials catalogs in the branch library and reading rooms were observed simultaneously during alternate Main Library card catalog observation periods. The serials catalog in staffed locations in the Main Library were observed during the same alternate periods. Following reciprocal alternate observation periods, one of the eleven serials catalog stack locations was observed. Selection of the site was randomly determined based on the assumption that a sample of the stack locations would adequately represent serials catalog use on the floors and tiers of the Main Library.

Taking into account that several observation periods were accidentally missed, a total of 2,327 sample counts were collected.

TIME:
DAY:
DATE:
LOCATION:
RECORDER:
COMMENTS:

Mark an X on schematic for each individual in catalog area.

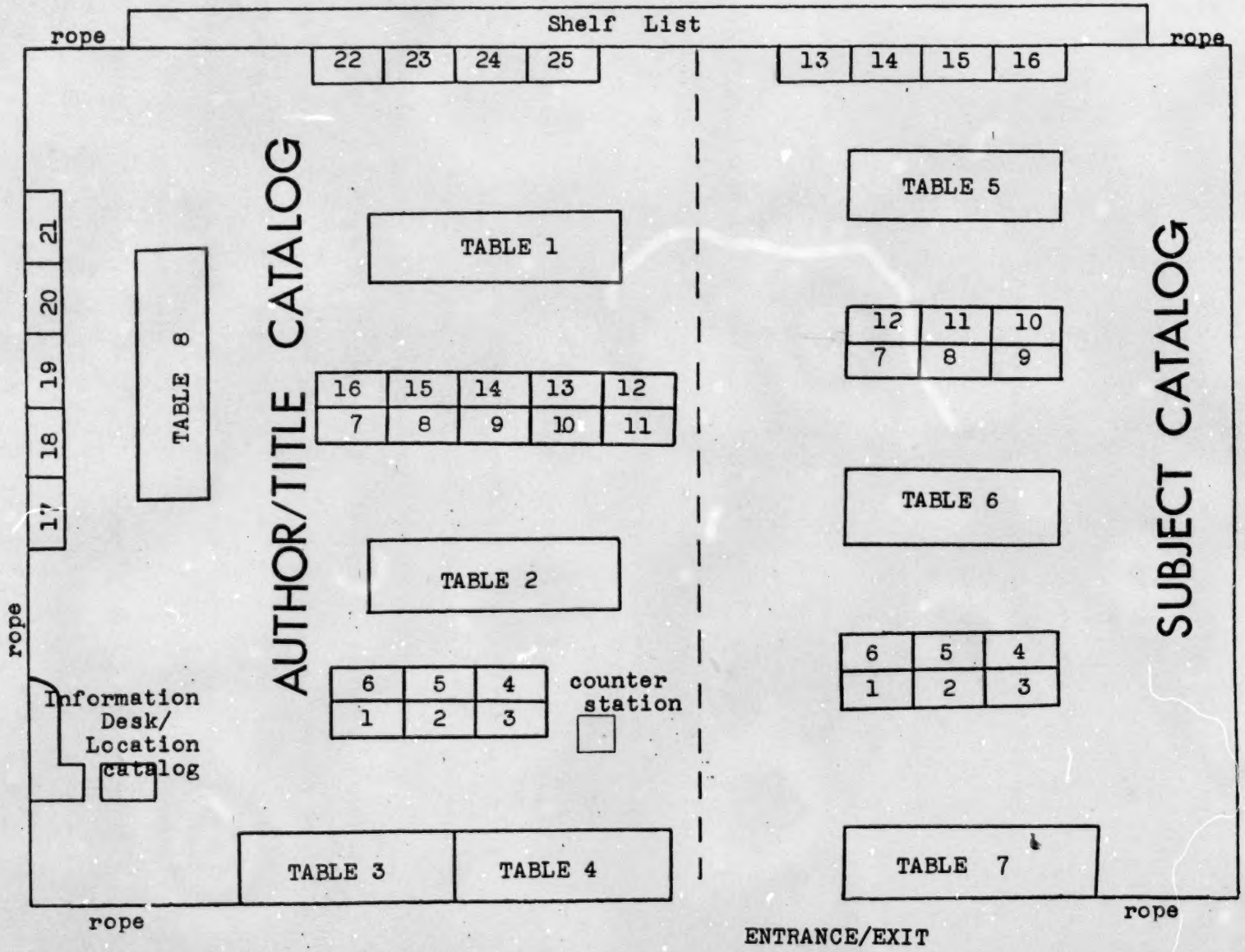


Figure 1. Schematic of ISU card catalog area.

Results

Scatter Diagrams and Pearson Correlations of Card Catalog Use to Circulation and Exit Counts

Interpretation of the data for this portion of the study began with the hypothesis that a functional relationship exists between card catalog use and three routinely measured and accumulated statistical variables, namely exit count, books circulated, and number of persons checking out books. If these correlations do, indeed, exist, we wanted to show how the value of card catalog use could be predicted from data collected in the Circulation Department and at Library exit points.

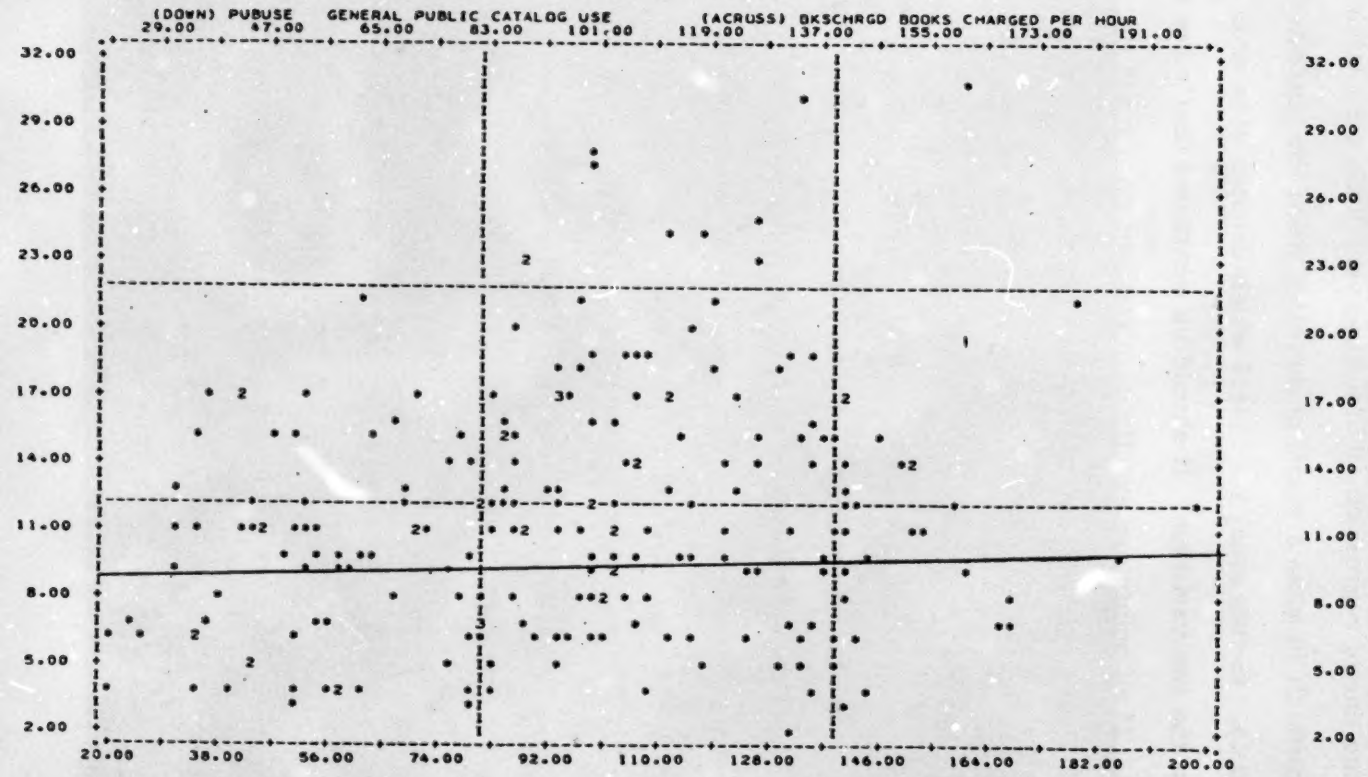
Scatter diagrams (Figures 2-4) were prepared plotting card catalog use on the vertical axis and circulation and exit counts on the horizontal axes. We applied a common statistical procedure for fitting a line to a scatter diagram, the least-square regression, using the Statistical Package for the Social Sciences (SPSS). In addition to producing a scatter diagram, the subprogram calculated Pearson's r, r^2, Significance, Standard Error of Estimate (SEE), Intercept, and Slope. Pearson's r serves two purposes: the first as an indicator of goodness of fit of the linear regression and the second, a measure of association indicating the strength of the linear relationship between the two variables. Essentially, r is a measure of the proportion of variance in one variable affected by the other. SEE may be interpreted as an average residual or average error in predicting a point on the regression line from the regression equation. Intercept and Slope were used to plot the regression line.

Figure 2 is the result of plotting number of catalog users per hour and number of books charged per hour. There is very little concentration of points near the line of regression, illustrating very little correlation. Actually, it is difficult to make a visual observation when the absolute value of r is less than .3. In this case, r = .14618 which denotes little or no relation between the two variables. It should be mentioned that r has an upper limit of 1. If all points are exactly on a straight line, r will be either 1 or -1 depending on whether the relationship is positive or negative. Examining r^2 one sees that 2% of the variation observed in one variable are explained in the other.

The sample size is sufficiently large ("Central-limit Theorem"[1]) to justify the assumption that the sampling distribution is normal. The standard error of estimate, or the amount of prediction error associated with predicting catalog card use, is ±5.35 persons. At 95% confidence level, the interval is ±10.48 persons per ten-minute period.

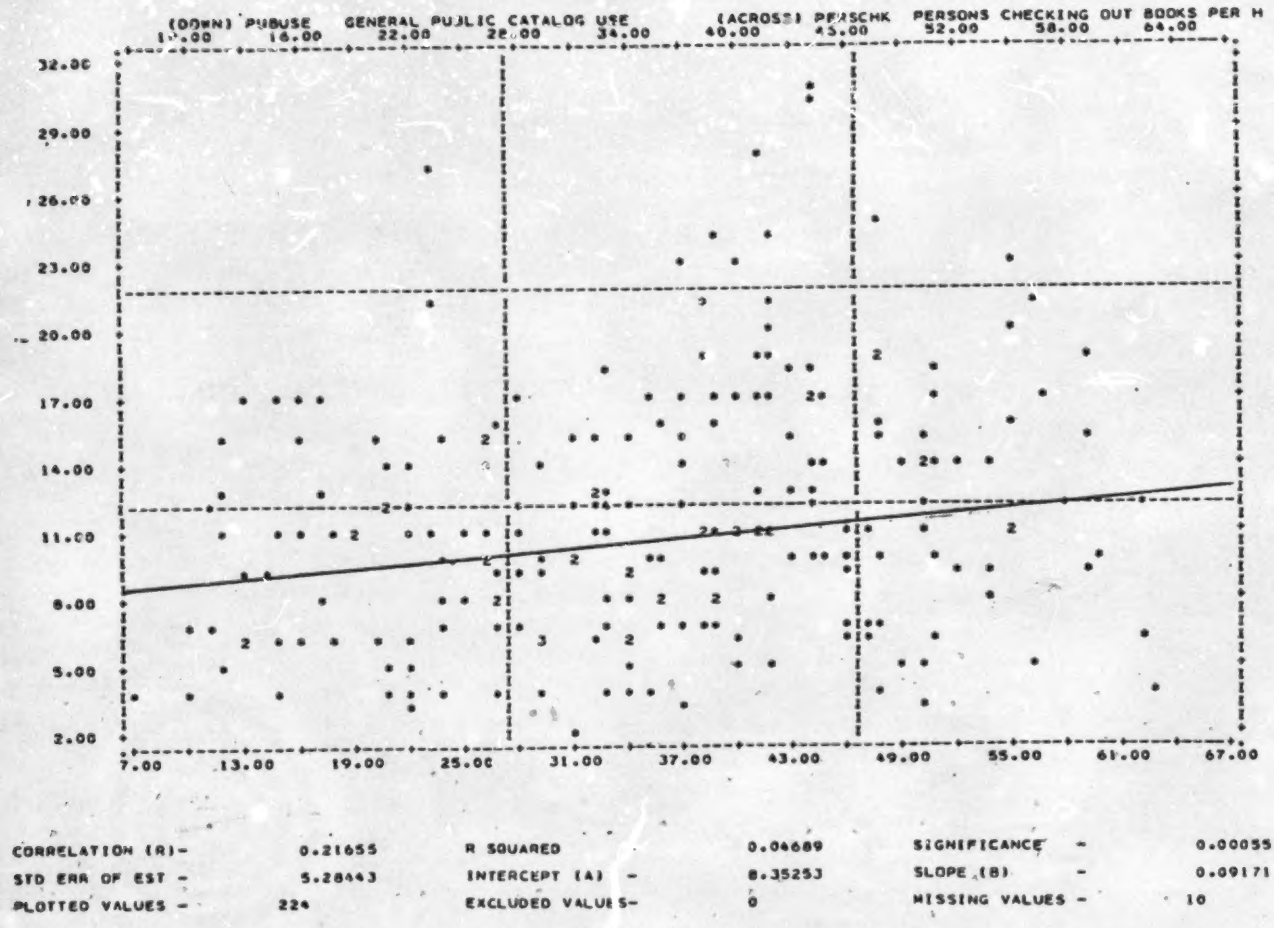
The second comparison of number of persons checking out books with those using the card catalog, as shown in Figure 3, indicates better correlation than Figure 2, although with r at .21655, it is still quite low. At 5%, r^2 still shows very little dependence of one variable on the other. Standard error of estimate is approximately the same as in the previous example.

Comparison of the number of persons exiting the Library with those using the card catalog is shown in Figure 4. Again, r and r^2 are low and indicate there is very little relationship between the two variables. The SEE is similar.



RRELATION (R)-	0.19203	R SQUARED -	0.03687	SIGNIFICANCE -	0.00196
D ERR OF EST -	5.31212	INTERCEPT (A) -	8.85120	SLOPE (B) -	0.02848
LOTTED VALUES -	224	EXCLUDED VALUES-	0	MISSING VALUES -	10

Figure 2. Scatter diagram: Number of books charged per hour by number of catalog users per ten-minutes.



CORRELATION (R)-	0.21655	R SQUARED	0.04689	SIGNIFICANCE -	0.00055
STD ERR OF EST -	5.28443	INTERCEPT (A) -	8.35253	SLOPE (B) -	0.09171
PLOTTED VALUES -	224	EXCLUDED VALUES-	0	MISSING VALUES -	10

Figure 3. Scatter diagram: Number of persons checking out books per hour by number of card catalog users per ten-minutes.

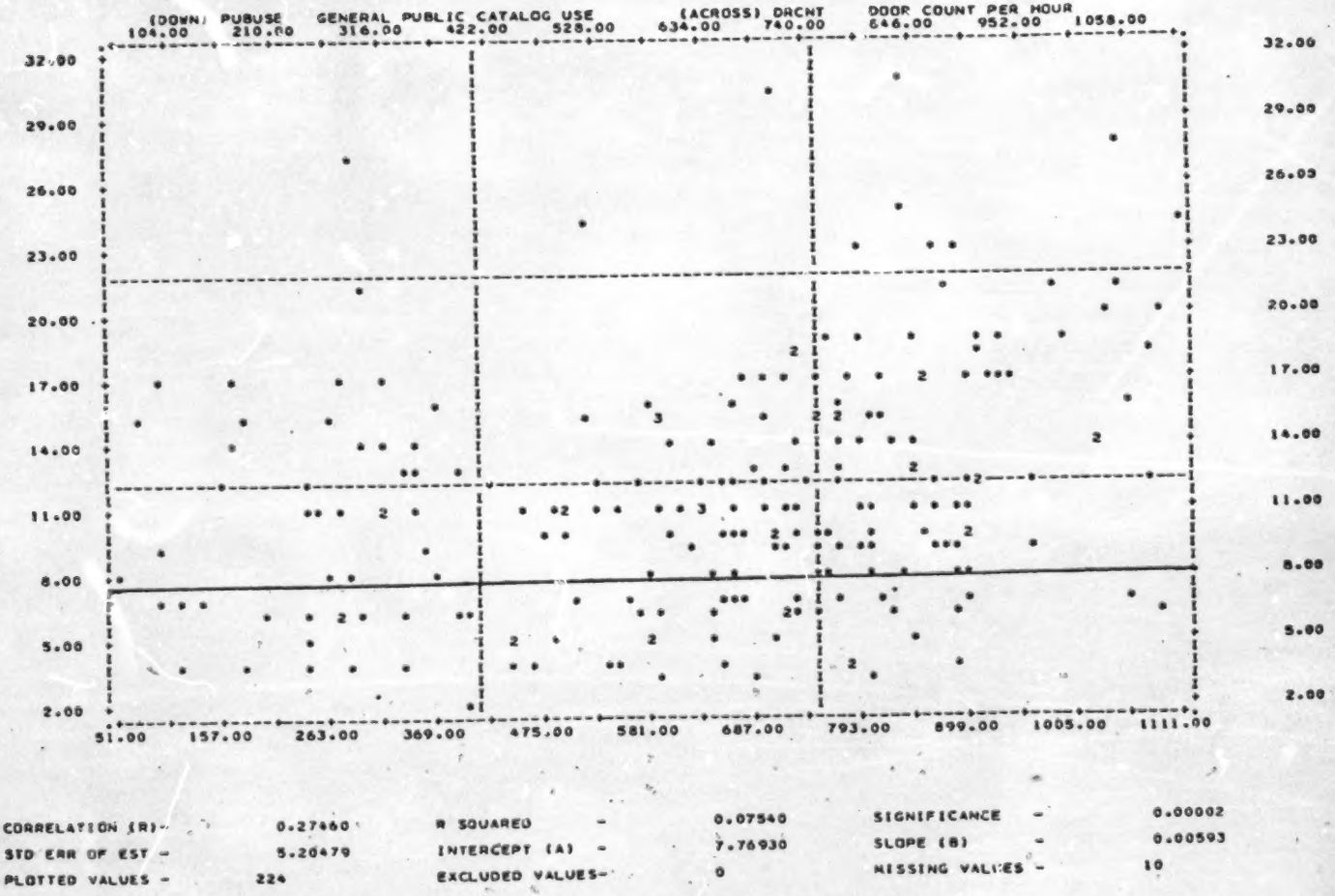


Figure 4. Scatter diagram: Number of persons exiting the Library per hour by number of card catalog users per ten-minutes.

Average frequencies per peak hour are shown in Figures 5 and 6. Numbers of persons exiting the Library, persons checking out books, and books circulated fluctuate over a wider range of frequencies than does the number of card catalog users.

Since little correlation exists between the variables tested within duplicate time periods, it was decided to offset the hours of comparison so that circulation and exit counts trailed card catalog usage counts. The greatest increase of correlation was with a one hour differential between number of books charged and number of users at card catalog. The value increases from .27460 (see Figure 2) to .47074. At 22%, r^2 still shows little dependence of one variable on the other indicating that even in the best of circumstances the relationship of card catalog use to books circulated is minimal.

Determining Arrival Rates by Isolating "Peak of Peaks"

The lack of correlation between card catalog use and circulation or door count statistics implies that these statistics are inadequate surrogates for catalog use; therefore, arrival rates at the catalog must actually be observed in order to predict the number of catalog devices required to meet user needs.

Using the same arrival rate data as above, we attempted to determine a mean arrival rate that ultimately would be used to calculate the number of devices for alternate forms of a card catalog. Mean arrival rates, broken down by day and by time can be seen in Tables 1 and 2. The analysis of variance reveals that the hourly means are significantly different from each other ($F = 9.24$, $p < .01$), as are the daily means ($F = 2.68$, $p = .02$). It seemed as if disproportionately low catalog use on Friday and Sunday might

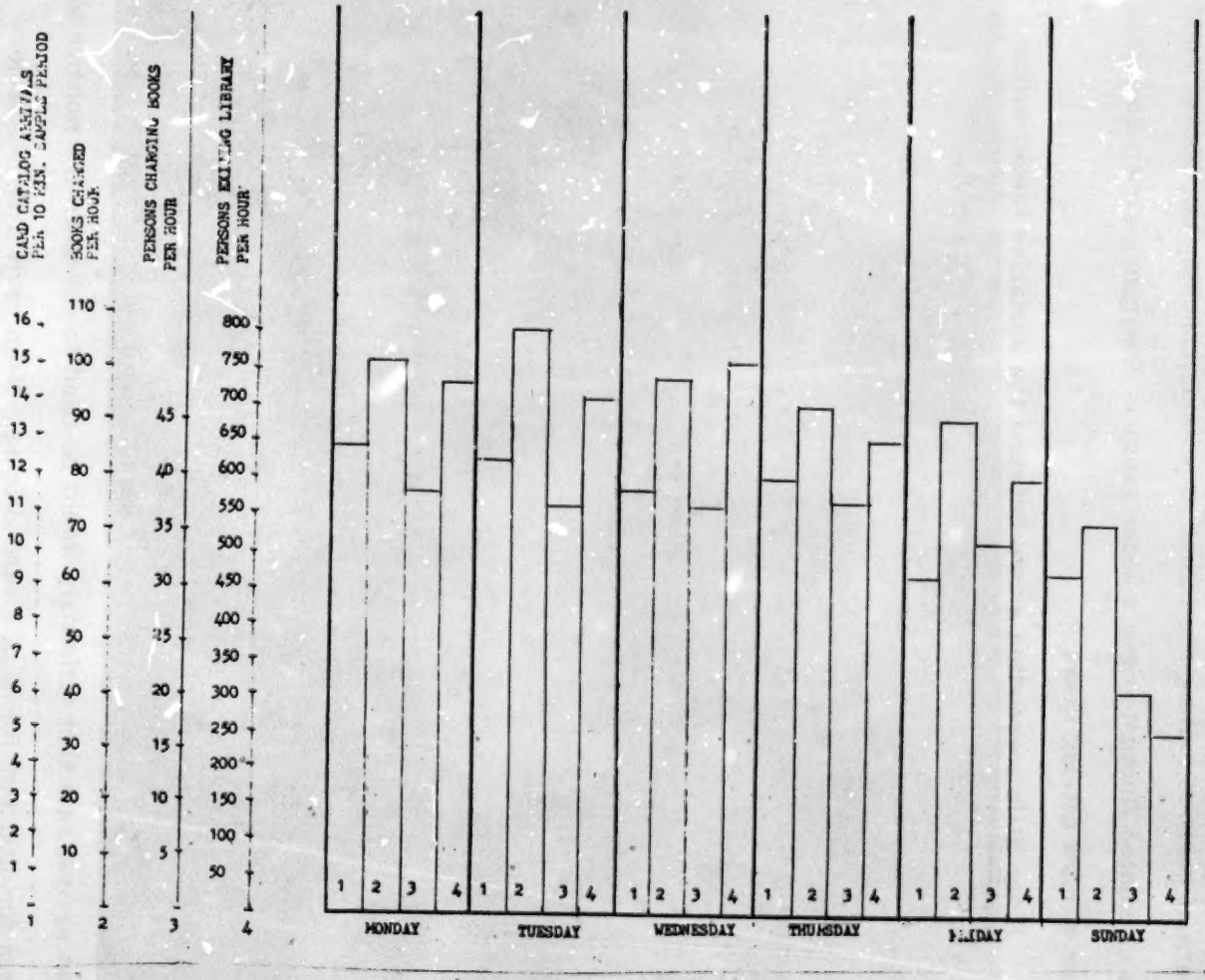


Figure 5. Histogram: By day of week.

Table 1. Average number of arrivals at the card catalog per ten-minute observation period, by day.

Monday	Tuesday	Wednesday	Thursday	Friday	Sunday
12.9	12.7	11.9	12.1	9.6	9.8
n=42	n=41	n=40	n=42	n=36	n=30

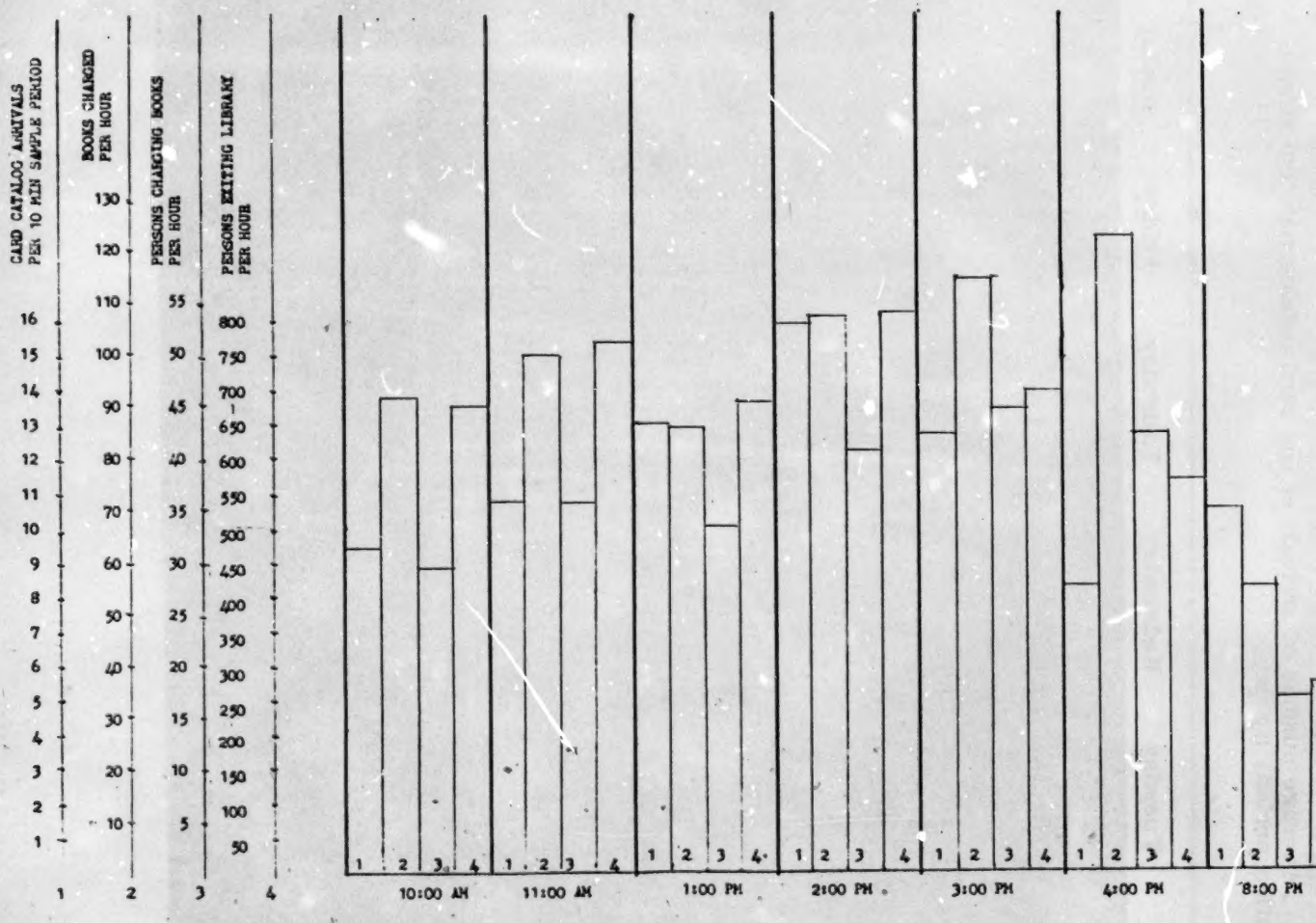


Figure 6. Histogram: By hour of day.

17-A

Table 2. Average number of arrivals at the card catalog per ten-minute observation period, by hour.

A. Including Friday and Sunday

10:00 AM	11:00 AM	1:00 PM	2:00 PM	3:00 PM	4:00 PM	8:00 PM
9.7	10.9	13.1	15.8	12.8	8.3	10.2
n=30	n=30	n=36	n=35	n=35	n=36	n=29

B. Excluding Friday and Sunday

10:00 AM	11:00 AM	1:00 PM	2:00 PM	3:00 PM	4:00 PM	8:00 PM
9.7	10.8	14.2	18.0	14.0	8.8	11.3
n=24	n=24	n=24	n=23	n=23	n=24	n=23

be responsible for the difference observed between the daily means, so a second analysis of variance was done, in which only the Monday through Thursday data were examined. When the Friday and Sunday counts are suppressed, there is no significant difference between the daily means ($F = .299$, $p = .83$); while the difference between the hourly means is accentuated ($F = 10.75$, $p < .01$). These analyses indicate that mean arrival rates remain fairly constant across the four days, Monday through Thursday; however, within each day, arrival rates fluctuate from hour to hour.

In order to determine the maximum number of catalog devices needed to serve users, it is necessary to isolate the busiest times of use at our present catalog. To identify these peaks of all peak times, count frequencies were tabulated for the Monday through Thursday data. Observation periods which had an arrival rate of 15.5 or more (this constitutes less than 10% of the cases) were identified as shown in Figure 7. Despite some scattering of peak use times, which is to be expected given the small sample size (i.e., each ten-minute period was observed only once for each day of the week), the heavy use periods cluster between 2:00 and 2:30 p.m. across all four days. We thus hypothesized that the mean arrival rate between 2:00 and 2:30, Monday through Thursday, is relatively constant.

The above time blocks were tested to determine the goodness of fit of the data to certain standard distributions. We had too little data for the 2:00 to 2:30 p.m., Monday through Thursday period to make that determination. Additional data were collected from January 8 through February 18, 1980 (one year after the original study, during a comparable six-week period). Observation periods were limited to the peak periods

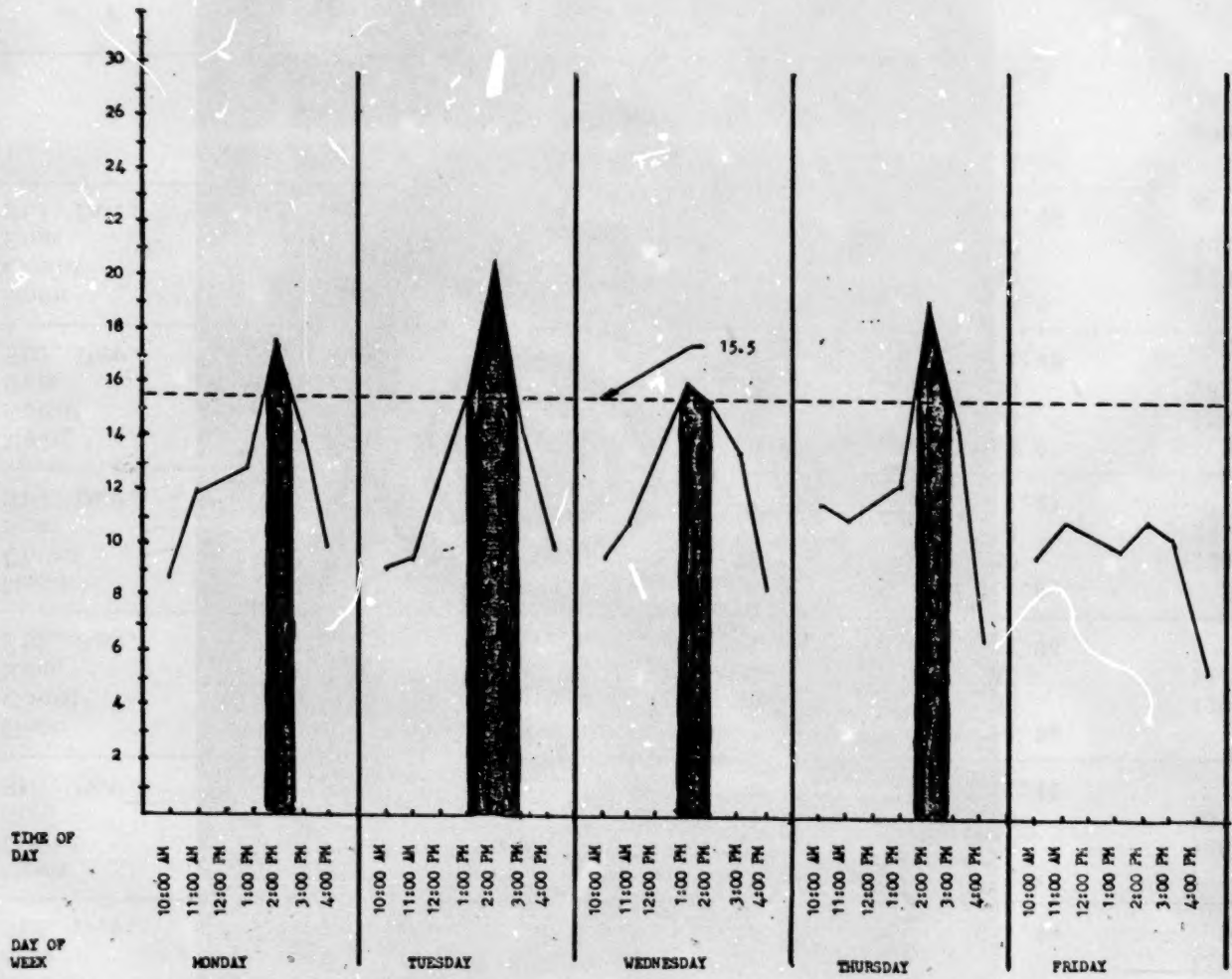


Figure 7. Frequency of arrivals at the card catalog by day and time (per ten-minute sample period).

Table 3. Average number of arrivals (public only) at the card catalog, per minute, 2:00 - 2:30 P.M.

Week		Monday	Tuesday	Wednesday	Thursday	Totals
1	Mean	-	1.73	1.8	1.77	1.77
	Count	-	30	30	30	90
	Sum	-	52	54	53	159
	Std. Dev.	-	.87	1.37	1.36	1.21
2	Mean	1.67	1.3	1.56	2.1	1.66
	Count	30	30	30	30	120
	Sum	50	39	47	63	199
	Std. Dev.	1.37	1.21	1.25	1.49	1.39
3	Mean	2.13	1.5	1.35	1.04	1.31
	Count	30	30	30	30	120
	Sum	64	45	57	46	212
	Std. Dev.	1.57	1.2	1.35	1.04	1.31
4	Mean	2.03	2.23	2.37	1.8	2.11
	Count	30	30	30	30	120
	Sum	61	67	71	54	253
	Std. Dev.	1.27	1.43	1.25	1.21	1.3
5	Mean	2.47	2.67	2.43	2.0	2.34
	Count	30	30	30	30	120
	Sum	74	74	73	60	281
	Std. Dev.	1.38	1.93	1.63	1.49	1.61
6	Mean	2.4	1.33	1.83	1.3	1.72
	Count	30	30	30	30	120
	Sum	72	40	55	39	206
	Std. Dev.	1.8	1.4	1.37	1.06	1.48
Totals		2.14	1.76	1.98	1.75	1.9
		150	180	180	180	690
		321	317	357	315	1,310
		1.5	1.43	1.42	1.3	1.4

Table 4. Comparison of the observed distribution of arrivals at the card catalog with the expected distribution, assuming a Poisson distribution and an average of 1.9 arrivals per minute.

Number of arrivals (x)	Probability f(x)	Expected number of 1-minute periods with x arrivals	Observed number of 1-minute periods with x arrivals	Chi-square, goodness of fit test
0	.15	103.5	108	.196
1	.285	196.6	195	.013
2	.27	186.3	185	.009
3	.17	117.3	113	.158
4	.08	55.2	54	.026
5	.03	20.7	24	.526
6 (or more)	.014	9.7	11	.254
Total	.999	(689.3)	690	1.182

of 2:00 to 2:30 p.m., Monday through Thursday. Counts were recorded for each minute, rather than for ten-minute periods, in order to increase the precision of the measure of arrival rate. A total of 690 one-minute samples were recorded. Table 3 shows the average number of arrivals per minute for each of the 30 one-minute observation periods with a mean arrival rate of 1.9 persons per minute over the entire sample.

With some reliance on the literature,[2, 3, 4] we compared the distribution pattern of arrivals with a Poisson distribution using the Chi-Square goodness-of-fit test. The results are shown in Table 4. At the 95% confidence level the observed data can be assumed to follow a Poisson distribution with an arrival rate of 1.9 persons per minute.

Serials Book Catalog/Card Catalog: Use Comparison

The distribution of serials book catalogs throughout the Library complicates the process of comparing the frequency of its use to the frequency of card catalog use. The comparison is based on the assumption that the many copies of the serials book catalog represent only one intellectual body of information. By combining the use frequencies for all six locations, the total frequency for serials catalog use was obtained (Table 5).

As previously described, five of the locations observed are staffed locations. The sixth location is an amalgamation of eleven copies of the serials catalog distributed throughout the Library stacks. We assumed the frequency of serials catalog use at any one of these stack locations is representative of all eleven locations. Each of the eleven copies was observed approximately eleven times, thus providing a total of 119 samples.

Patron use of the card catalog and total serials catalog use (at sixteen locations, accounting for 21 copies of the serials catalog) are shown

Table 5. Serials Book Catalog Use.

Location (number of copies)	Average number of users	Number of observation periods	Standard deviation	S^2
Reserve (1)	.50	117	.71	.50
Circulation (2)	2.66	115	1.50	2.25
Reference (4)	5.57	116	3.36	11.29
Periodicals (2)	4.74	117	2.67	7.13
Government Publications (1)	.21	115	.41	.17
Floors/Tiers (11)	3.88	119	6.60	43.56
Totals	17.56	699	8.06	64.90

Table 6. Serials Book Catalog Use and Public Catalog Use.

Location	Average number of users	Number of observation periods	Standard deviation (S or $\sqrt{\Sigma S^2}$)	Standard error $\frac{\sqrt{\Sigma S^2}}{n}$	$SE/\bar{X}$
Card Catalog	11.61	231	5.40	.36	.03
Serials Book Catalog	17.56	699	8.06	.30	.04

in Table 6. Again, assuming the sampling distribution is approximately normal, the 95% confidence interval for card catalog use suggests that the average frequency of use falls within the range of 10.9 to 11.6 users per ten-minute period. The comparable confidence interval for serials catalog use is 16.95 to 18.2 users per ten-minute period.

The ratio of serials catalog use to card catalog use (calculated from the means) is approximately 60:40. By taking the confidence intervals into account, this ratio ranges between 63:37 to 58:42. These results indicate that the serials catalog is used extensively and is probably consulted more frequently by patrons than the card catalog, especially in light of the fact that not all copies of the serials catalog were observed in this study.

Staff Use of Card Catalog

Staff use of the card catalog was measured simultaneously during the periods when the total card catalog use was sampled. In addition to being counted as arrivals, staff were required to sign a special sheet at the card catalog entrance point. For the purposes of this phase of the study, staff use of the catalog refers to all staff who, for whatever purpose, entered the card catalog area from Monday through Friday (Sunday excluded) and during the hours of 10:00 a.m. - 12:00 p.m. and 1:00 p.m. - 5:00 p.m. (8:00 p.m. excluded). A summary of the staff and total arrivals are shown in Table 7. The heaviest staff use (27%) was between 10:00 a.m. and 12:00 p.m. After the lunch hours, staff use tapers off and ranges between 16% and 19% of total use. Staff use accounts for 20.5% of the total card catalog use.

Placement of Users Within Card Catalog Area

Measurements of the placements of card catalog users within the catalog area was accomplished by marking the location of all people inside

Table 7. Comparison of staff use to total use of the card catalog, by time of day.

Time of day	Number of total users (staff & patrons)	Number of staff users	Percent of staff users
10:00 AM	13.2	3.5	27
11:00 AM	14.8	4.0	27
1:00 PM	16.4	3.1	19
2:00 PM	19.8	3.2	16
3:00 PM	16.2	2.9	18
4:00 PM	10.1	1.8	18
Total Average (n=178)	15.1	3.1	21

the roped-off area at the end of each of the 234 ten-minute counting periods. A schematic drawing of the area was used as the form for noting locations (Figure 1).

Though admittedly a crude means of measuring catalog-use distribution, we nevertheless extracted from the data some useful information. We counted a total of 2,206 people within the area (an average of 9.4 per count). Of these 1,136 (51%) were located in the author/title section of the area and 1,070 (49%) in the subject section.

Several surveys have been done which examine the types of catalog searches performed by users. Lipetz[4] found that about three-fourths of all searches are (at least initially) known-item (i.e., document or author) searches. Tagliocozzo and Kochen[5] found that approximatley 65% of the searches analyzed were known-item searches. It is difficult to compare these findings to the results of this study in light of the different methodology used (i.e., observed user locations as opposed to user interviews). Assuming that the use of a catalog (subject or author/title) provides a rough indication of the type of search being performed, a tentative comparison can be made.

Both of these studies previously mentioned, based upon actual interviews with catalog users, had the advantage of user-status data. From these data, the investigators could see that use of the subject searches declined as the status of the users increased. Underclasspersons tended to perform subject searches proportionately more than upperclasspersons who, in turn, used subject searches more than graduate students and faculty. As expertise grows in a field, the researcher tends to use the more specialized indexes and abstracts to journals and non-convention report literature and to be familiar with specific authors and titles. Conversely, undergraduates

are the group most likely to be searching the subject catalog.

This observation helps to explain the relatively low (51%) use of the author/title catalog observed in this study. Iowa State University's graduate and research programs are concentrated in technology and the sciences - areas in which literature searches are drawn principally from journal and report literature. A related factor effecting the use of the author/title catalog at Iowa State is the autonomous serials catalog. A person scanning the indexing and abstracting services or using a computer-generated subject bibliography and locating a particular journal title of interest does not then search for that title in the card catalog (a typical known-document search), but instead locates the title in the serials book catalog. Comparison of serials catalog and card catalog use at ISU, indeed, shows heavier use of the serials catalog. We can therefore speculate that the use of the serials catalog lowers the use of the author/title section of the card catalog because of the elimination of serial title searches.

Table 8 shows a more specific breakdown of the distribution of users at the card catalog. Use is fairly evenly distributed throughout the catalog area, suggesting that no one specific area is more heavily used than any other area.

Special Locations

Analysis of data from the extramural collections (four subject-specialized reading rooms and the Veterinary Medical Library) and the internal, self-contained Microform/Media Center simply allowed us to support with observations what we had surmised before the study - that none of these collections experiences heavy use of either its card catalog or the Library's serials catalog.

Table 8. Card Catalog Use by Sections.

Author/Title Section:	Users
A-Brown, R (3 units)	162
Brown, S-DIGF (3 units)	144
DIGG-IMPERIAK (5 units)	227
Imperial-New York, Unit (5 units)	191
New York, Univ-Steep (5 units)	215
Steep-ZZ (4 units)	197
TOTAL	1,136

Subject Section:	Users
A-CIU (3 units)	201
CIV-FRID (3 units)	220
FRIE-MASS (3 units)	216
MASSA-Rail (3 units)	210
RAIM-Z (4 units)	223
TOTAL	1,070

Tables 9 and 10 show average card catalog and serials catalog use per ten-minute counting period, standard deviation and the 95% confidence limits where the least and most amount of use in the ten-minute period are represented. Size and make-up of these collections are important considerations as is the type of clientele which each serves when comparing the figures to these tables. Therefore, this information is given below the name of each of the branches.

Comparison of the use of catalogs in extramural collections and in the Main Library is counterproductive because of the disparity in the sizes of catalogs and collections. Browsing in the branch facilities is probably as efficient a means of searching as the use of the card catalog at least in terms of a subject search. Because of the limited sizes of these collections, users of these facilities become familiar with their particular areas of interest and staff, too, come to know the collections intimately.

Based upon the data in this study, if ISU converted to a COM catalog, with each of these facilities having only the film catalog of its own collection, one reader in each facility would be sufficient. However, if the film catalog were of the entire ISU Library's holdings, or if an on-line catalog were made available, the additional access to all of the Library's collection would most probably effect the demand on these devices. Obviously, this study is not useful in making predictions for either of these possibilities.

Table 9. Card catalog use in special locations during ten-minute samples.

Location (number of monograph vols.)	Average number of users	Standard deviation	Number of users at a 95% confidence level
Design Reading Room (6,250)	.72	.76	.58 - .86
Economics/Sociology Reading Room (5,500)	.26	.58	.15 - .37
Engineering Reading Room (5,400)	.51	.92	.34 - .68
Microform/Media Reading Room (figures unavailable)	.26	.57	.16 - .36
Physical Sciences Reading Room (4,250)	.33	.63	.22 - .44
Veterinary Medical Library (12,350)	.66	.91	.49 - .83

Table 10. Serials catalog use in special locations during ten-minute samples.

Location (number of serial vols. and/or titles)	Average number of users	Standard deviation	Number of users at a 95% confidence level
Design Reading Room (titles: 154, volumes: 265)	.13	.34	.07 - .19
Economics/Sociology Reading Room (titles: 166)	.10	.40	.03 - .17
Engineering Reading Room (titles: 281)	.13	.48	.04 - .22
Microform/Media Center (figures unavailable)	.44	.66	.32 - .56
Physical Sciences Reading Room (titles: 381, volumes: 20,717)	.84	1.08	.64 - 1.04
Veterinary Medical Library (titles: 781)	.27	.50	.18 - .36

Conclusion

The purpose of this study was to collect information which would provide a description of catalog use at the Iowa State University Library. This information will be used in developing plans for the future of the catalog.

In an attempt to determine the number of catalog devices necessary to satisfy user needs during peak use periods several analyses were conducted. The lack of correlation between regularly gathered statistics (i.e., circulation statistics and door counts) and catalog use, suggest that these statistics could not be used to accurately predict the optimum number of COM stations or CRT terminals required by catalog users during peak use times. Consequently, arrival rates at the catalog must be observed before such predictions can be made.

The initial observations of catalog use were used to pinpoint peak use times. Further observation of the heaviest catalog use period enabled us to verify the assumption that the Poisson distribution provides an accurate description of the distribution of arrivals at the catalog during the peak use period. To complete the queueing model, user service times must be measured or hypothesized for given types of service devices, such as CRT terminals, microform readers, etc. With this data, a model can be constructed to produce various scenarios of waiting and process times depending on the number of catalog devices available.

Another objective of this study was to compare card catalog use to serials book catalog use, in order to investigate whether the physical separation of serials and monographic bibliographic information is justified.

The heavy use of the serials catalog (60% of all catalog use) does seem to justify the separate maintenance of the serials catalog. Given a different format for the catalog, the possibility of reintegrating serials and monographs, however, could be considered.

The observed patterns of staff catalog use can be used to reschedule staff hours at the catalog in order to avoid heavy staff use during peak patron use periods.

Initially, we had hoped that a delineation of the exact positions of users within the card catalog area would be helpful in the event that the ISU Library administration chose a COM format for our future catalog. Since the use of our divided author/title-subject card catalog was almost evenly split and because distribution of users throughout the entire catalog area was fairly even, there are two options for the design of a microfilm catalog. The catalog, in film form, could remain divided with an equal number of readers for the author/title and the subject sections; or a dictionary catalog could be produced with each reel containing a set number of records (analogous to the sections of the card catalog containing a set number of cards). These two plans, however, are only feasible with a separate serials catalog, for the very absence of serials information from the card catalog probably accounts for the Library's ratio of author/title to subject use of the "monographs" catalog (51:49).

The relatively light use of public catalogs in special locations outside of the Main Library indicates that only a minimal number of catalog devices will be necessary to satisfy patron needs at these locations. The actual number

of devices needed will be more dependent on the catalog format than on the number of users in these locations.

In conclusion, this study has provided valuable information on patron and staff use of the Library's public catalogs. Although no final decisions have been made concerning the future of Iowa State University Library's public catalogs, we are confident that these analyses will help us to make more informed decisions for the future.

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